The Importance of Verbal Language in the Development of Social Understanding in Autistic Children

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Highlights

- Autistic children depend more heavily on verbal language to draw attention and bring meaning to nonverbal social cues they would otherwise miss.

- Nonverbal measures of social understanding, such as facial expression, eye gaze and biological motion, are successfully being employed to explore the relationship between verbal language and social understanding in contemporary autism research.

- Existing literature is limited by its use of the deficit model of autism; this limitation could be mitigated by qualitative research which employs a humanistic model.

Points clés*

- Les enfants autistes dépendent davantage du langage verbal pour attirer l'attention et donner un sens aux signaux sociaux non verbaux qu'ils auraient autrement manqués.

- Des mesures non verbales de la compréhension sociale, telles que l'expression faciale, le regard et le mouvement biologique, sont utilisées avec succès pour explorer la relation entre le langage verbale et compréhension sociale dans la recherche contemporaine sur l'autisme.

- La littérature existante est limitée par son utilisation du modèle déficitaire de l'autisme; ce limite peut-être atténuée par une recherche qualitative qui utilise un modèle humaniste.

*French Translation | Kyleigh Marie Kai-Li Melville

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Abstract

Language has been identified as a significant factor for long-term cognitive, social and adaptive outcomes, such as social understanding. The relationship between verbal language and social understanding has been widely explored in typically developing children. However, the same could not be said for the relationship between verbal language and social understanding in autism. To fill this gap, the following literature review evaluated studies which have employed nonverbal measures to investigate the impact of an absence of verbal language on the development of social understanding in autistic children. Nonverbal measures were used to explore how autistic children attend to and process nonverbal language and social cues such as facial expressions, eye gaze and biological motion. Across the reviewed literature, it was strongly hypothesised that autistic children depend more heavily on verbal language to bring attention and meaning to nonverbal cues they would otherwise miss. Limitations of the reviewed studies were further discussed. Future research investigating this relationship would benefit from discarding a deficit model of autism and instead employing a humanistic perspective which can lend a holistic understanding. In addition, the use of qualitative methods in the form of semi-structured interviews can encourage more participants from under-represented subgroups on the spectrum (i.e., minimally and nonverbal autistic females) to feel empowered in sharing their unique experiences.

Résumé

La langue a été identifiée comme un facteur important pour les résultats cognitifs, sociaux et adaptatifs à long terme, tels que la compréhension sociale. La relation entre le langage verbal et la compréhension sociale a été largement explorée chez les enfants au développement typique. Cependant, on ne peut pas en dire autant de la relation entre le langage verbal et la compréhension sociale dans l'autisme. Cette revue de littérature a évalué les études qui ont utilisé des mesures non verbales pour étudier l'impact d'une absence de langage verbal sur le développement de la compréhension sociale chez les enfants autistes. Des mesures non verbales ont été utilisées pour explorer comment les enfants autistes traitent le langage non verbal et les signaux sociaux tels que les expressions faciales, le regard et les mouvements biologiques. Dans la littérature examinée, il a été fortement émis l'hypothèse que les enfants autistes dépendent plus fortement du langage verbal pour attirer l'attention et la signification des signaux non verbaux qu'ils auraient autrement manqués. Les limites des études examinées ont été discutées plus en détail. Les recherches futures sur cette relation gagneraient à rejeter un modèle déficitaire de l'autisme et à utiliser à la place une perspective humaniste qui peut apporter une compréhension holistique. De plus, l'utilisation de méthodes qualitatives sous la forme d'entretiens semi-structurés peut encourager davantage de participants de sous-groupes sous-représentés sur le spectre (c'est-à-dire les femmes autistes minimalement et non verbales) à se sentir habilités à partager leurs expériences uniques.

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Introduction: key definitions and aims of the review

Language is a rule-governed, goal-oriented meaningful communication system which uses symbols (i.e., words, phrases) to represent everything we can experience in the world (Honig, 2007). The act of talking is our application of such rules in specific situations to make sense of verbal and nonverbal social cues and differing perspectives or beliefs among individuals (Turnbull & Carpendale, 2001). In contrast, nonverbal language is the transmission of messages from nonverbal cues such as eye contact, facial expression, gestures, posture and body language (Burgoon et al., 2010). As we get older, language expands our mental capacities so that we can think about the past, present and future (Hughes, 2011). The development of language occurs alongside advances in children's executive control, such as inhibitory response and the ability to engage in behaviourally and mentally flexible, goal-directed actions (Hughes, 2011). Consequently, language has been identified as a significant factor for long-term cognitive, social and adaptive outcomes, such as social understanding.

Social understanding has been defined as the ability to explain, predict and interpret verbal and nonverbal behaviours through successful attribution of one's own mental states and the mental states of others in social situations (Hughes, 2011). Research has consistently suggested that young children are capable of understanding and engaging in their social world (Hughes, 2011). From birth, infants engage in eye contact with others and pay strong attention to human faces and speech, culminating in the ability to respond to verbal and nonverbal social cues (Tager-Flusberg, 1999). Overtime, infants gain competency at achieving and maintaining joint attention between themselves and social and non-social entities (Turnbull & Carpendale, 2001). By the age of four, most children are able to explain, predict and interpret behaviours and verbal language by attributing their own mental states (i.e., beliefs, desires, intentions, emotions) and the mental states of others (Hughes, 2011). A group that has been identified to exhibit co-occurring impairments in social understanding and language use are autistic children.

Autism is a neurodevelopmental disorder primarily characterised by deficits in social communication, language use and motor behaviour (Frith, 2008). Seminal research conducted by Kanner (1943) outlined atypical presentation and use of most language aspects in autistic children including semantics (i.e., meaning), syntax (i.e., grammar), pragmatics (i.e., using language to function in social situations and foster social understanding) as well as super-segmental language aspects (i.e., rhythm, rate, intonation, volume of speech).

The language phenotype in autism is multifaceted, so much so that some children may not develop language at all, acquire language on par or more prolific than their typically developing peers, or have specific difficulty with using language socially (Taylor et al., 2014). Autistic children who develop verbal language have been observed to use verbal language for instrumental (e.g., asking for help in achieving a goal) rather than for social purposes (e.g., small talk) and the content of said language is often characterised as repetitive and egocentric (Boucher, 2003). In addition, conversations tend to be non-reciprocal, with particular difficulties in comprehending and using nonverbal language such as facial expressions, gestures and vocal prosody (Taylor et al., 2014). The greatest challenge for this group of children has been suggested to be the development of social understanding, as they often misinterpret verbal and nonverbal social cues, have a weaker understanding of emotions, and difficulty with regulating emotions in spontaneous situations (Barnhill et al., 2002).

Although the relationship between verbal language and social understanding has been widely explored in typically developing children, the same cannot be said for the relationship between verbal language and social understanding in autism. To fill this gap in the literature, this literature review sought to evaluate studies which have employed nonverbal measures to investigate the impact of an absence of verbal language on the development of social understanding in autistic children. This literature review further aims to critically analyse the studies and discuss their limitations.

The terms "verbal language" and "talk" will be used interchangeably to mean verbally conveying socially meaningful information, ideas and feelings according to the language's grammatical rules. Identity-first language will be used (i.e., "autistic person" instead of "person with autism") as modern autism research suggests it to be less stigmatising (Bagatell, 2010; Gernsbacher, 2017).

Literature was found using *iDiscover* (https://idiscover.lib.cam.ac.uk), *Google Scholar* (https://scholar.google.com) and *Research Rabbit* (https://www.researchrabbit.ai) (see Appendix for specific search terms). The inclusion criteria were: (i) research conducted from 1980 onwards to gain a thorough understanding of seminal research and contemporary research from Western and non-Western countries, (ii) research which used autistic child samples aged 2+ years as this is the expected minimum age for atypical verbal language use to present itself (Honig, 2007), (iii) studies which compared autistic children with another neurodiverse group and/or a group of typically developing children, and (iv) studies which employed standardised and experimental nonverbal measures.

Prior to evaluating these studies, the following section will outline how the relationship between verbal language and social understanding has been predominantly explored.

Conceptualising and operationalising social understanding: theory of mind and false beliefs tasks

The prevailing account through which the relationship between language and social understanding in children has been examined is Theory of Mind. Theory of Mind suggests impairments in social understanding can be explained by a deficit in the ability to represent one's own mental states and the mental states of others (Happé, 1995). One's Theory of Mind encompasses *socio-perceptual* (judgement of mental states based on nonverbal social cues) and *social-cognitive* components (constructing a representational Theory of Mind via the integration of information across social cues and interactions overtime) (Tager-Flusberg & Joseph, 2005). Research suggests three possibilities on the nature of the relationship between language and Theory of Mind: (i) Theory of Mind depends on language, (ii) language depends on Theory of Mind, or (iii) both depend on a third factor (e.g., executive function). Research with typically developing children has generally reported that language is necessary to the development of a Theory of Mind as language provides children with access to the social world, enables them to experience and talk about mental states with their social circle, and gives them the opportunity to learn about the mental states of others (Astington & Jenkins, 1995). The quality and strength of one's Theory of Mind and overall social understanding has been widely measured using false-belief tasks (Milligan et al., 2007). False-belief tasks are based on false-belief understanding, where the understanding of an individual's belief or representation about the world may not align with reality (Wellman et al., 2001). In the original false-belief task (Baron-Cohen et al., 1985), the experimenter presents a situation to the participant in which a protagonist (P) has an object and puts it in one specific location (e.g., on a shelf). P leaves the scene and during their absence, another character moves the object to a different location (e.g., to a basket). The participant is then asked where P will look for the object when they return. Children with a strong Theory of Mind have been consistently observed to be successful in predicting P's behaviour on the basis of P's false-belief (i.e., P will look for the object in the location they last saw it). In contrast, children with a weak Theory of Mind, notably autistic children, have been observed to predict P's behaviour based on their own beliefs (i.e., P will look for the object in the changed location). A seminal longitudinal study found a significant relationship between false-belief tasks and

The Test of Early Language Development (Astington & Jenkins, 1999). Hierarchical regressions indicated that earlier language competence predicted later false-belief task performance, but not vice versa. It is worth noting that due to the study's small size ($n = 59$), these findings are not generalisable. Nonetheless, this study has been reliably replicated in numerous studies with larger samples. Milligan et al.'s (2007) meta-analysis reviewed 104 cross-sectional studies which investigated language ability and false-belief understanding in typically developing children aged up to seven ($n = 8,891$). Independent of age, a significant correlation was found between children's language abilities and false-belief understanding.

The following table outlines the reviewed studies that sought to explore the relationship between verbal language and social understanding through measuring the absence of verbal language (i.e., nonverbal language) in autism.

Using nonverbal measurements to investigate the relationship between language and social understanding

The impact of an absence of verbal language on social understanding in autism was first explored in Mundy et al.'s (1986) seminal study. In this study, they employed nonverbal measures (The Early Social Communication Scales) to compare frequency and quality of social behaviours between typically developing and autistic children. They found that the autistic group engaged in significantly briefer turn-taking sequences, exhibited less pointing and requesting behaviours, responded less frequently to invitations to partake in games, and initiated less eye contact. This study was limited in terms of its small size ($n = 18$ autistic children in the sample, $n = 36$ in total). Nonetheless, Mundy et al.'s (1986) findings have been replicated in research with larger samples in which autistic children tended not to use nonverbal communication behaviours due to not being aware, interested or able to understand them compared with both typically developing and other neurodiverse groups when cognitive development was a controlled factor (Travis et al., 2001; Rogers, 2006).

The relationship between language and Theory of Mind in autistic children was notably explored by Happé (1995), whose study was one of the first to accrue a larger than average sample ($n = 70$). Verbal language ability was a strong predictor of Theory of Mind for autistic children. A two-threshold model further demonstrated that the autistic children required a verbal mental age score of at least 5.5 to pass, whereas the typically developing and mentally delayed children could pass the tasks with a verbal mental age score as low as 2. Happé (1995) concluded that a weaker Theory of Mind can significantly hamper language learning

Table 1 List of studies selected for the literature review

Study	Measures (* = nonverbal)	Sample	Country
Mundy et al. (1986)	*Early Social Communication Scales (ESCS): prompting nonverbal affiliative, indicating and requesting behaviours with stimulating toys	$n = 54$ (18 autistic, 18 typically developing, 18 mentally delayed); aged 2-7	United States of America
Happé (1995)	False belief tasks, British Vocabulary Scale	$n = 174$ (70 autistic, 34 mentally delayed, 70 typically developing); aged 4-12	United Kingdom
Astington and Jenkins (1999)	False belief tasks, Test of Early Language Development	$n = 59$ typically developing; aged 3	United Kingdom
Fisher et al. (2005)	British Vocabulary Scale II, Test for Reception of Grammar, False belief tasks	$n = 176$ (58 autistic, 118 mild learning difficulties); aged 5-16	United Kingdom
Colle et al. (2007)	*Nonverbal variants of the classic Sally-Anne False belief task	$n = 42$ (12 autistic, 15 SLI, 15 typically developing); aged 4-8	United Kingdom
Klin et al. (2009)	*Ten point-light displays of children's games ('peek-a-boo', 'pat-a-cake')	$n = 76$ (21 autistic, 16 developmentally delayed, 39 typically developing); aged 1-2	United States of America
Centelles et al. (2013)	*Point-light displays (human and stick) of social interaction ($n = 52$) and non-social interaction ($n = 52$)	$n = 36$ (12 autistic, 24 typically developing); aged 4-10	France
Tye et al. (2013)	*EEG with specific focus on the N170 ERP response	$n = 92$ (19 autistic, 18 ADHD, 29 autism + ADHD, 26 typically developing); aged 8-13	United Kingdom
Groom et al. (2017)	*EEG with specific focus on the N170 and Early Directing Attention Negativity (EDAN) ERP responses	$n = 55$ (10 autistic, 12 ADHD, 20 typically developing, 13 autistic + ADHD); aged 8-15	United Kingdom
Lukito et al. (2017)	Weschler's Abbreviated Scale of Intelligence (WASI), ADOS-2, SRS parent ratings, SDQ (hyperactivity domain), PONS parent ratings, CAPA interview, false-belief task, Reading the Mind in the Eyes Task, Penny Hiding Game, Strange Stories Test, Frith-Happé Animated Triangles Task	$n = 100$ from the Special Needs and Autism Project (SNAP) population-based cohort; aged 10-12	United Kingdom
Loth et al. (2018)	*Films Expression Task: range of simple and complex naturalistic facial expressions with short presentation times	$n = 98$ (46 autistic, 52 typically developing); aged 15-55	United Kingdom
Sotoodeh et al. (2018)	*Nine videos and nine point-light displays of dynamic sequences, EEG, action recognition test	$n = 40$ (20 autistic, 20 typically developing); aged 6-17	Iran
Zhou et al. (2019)	*Eye-tracking of desirable and undesirable objects paired with social and nonsocial characters. Scenario involves 'K' facing a tall and short box holding a liked and disliked item (a strawberry and pepper) with a social and nonsocial character (a man and a tree) standing in between the boxes.	$n = 77$ (22 autistic, 55 typically developing); aged 4-5	China
Parker et al. (2021)	*Manipulated visual attention, EEG with specific focus on the N170 ERP	$n = 56$ (30 autistic, 26 typically developing)	United States of America

via nonverbal cues (e.g., joint attention, gestures to examples) and suggested that autistic children will particularly depend on verbally mediated routes of cognition to understand false-belief.

However, classic false-belief tasks are limited in that they require explicit verbal responses in order for participants to be recorded as successful. Colle et al. (2007) tested whether a nonverbal false-belief task would be able to distinguish between autistic children and children with Specific Language Impairment (SLI), as false-belief understanding has been previously reported to be intact in children with lower language ability (Miller, 2001). The autistic children performed significantly poorer compared to the SLI group and control group, suggesting that impairment in Theory of Mind is also present in the nonverbal autistic subgroup.

Across the existing literature, the following three types of nonverbal language emerged as the most widely explored: facial expression, gaze cues and biological motion. This may be due to the fact that they are well suited to be measured through non-invasive measures such as cameras and motion tracking technology (Burgoon et al., 2010).

Facial expression

The ability to infer emotions from facial expressions is crucial for many aspects of social communication, an ability that has been long suggested to be impaired in autism (Hobson, 1986). However, behavioural studies have produced mixed findings, ranging from profound deficits to intact facial recognition skills (Harms et al., 2010; Uljarevic & Hamilton, 2012). Loth et al. (2018) employed the Films Expression Task, where the children were presented with emotional adjectives (e.g., confident, pleased) followed by images of three facial expressions of the same actor or actress. The children had to select which image best represented the target emotion. They found that over half of children in the autistic group showed severe deficits (i.e., performing below two standard deviations of the typically developing children) and 15.3% performed normally. Electroencephalography (EEG) was employed by Kang et al. (2018) to measure event-related potentials (ERP), a method that is becoming more widely used as it does not rely on language or behavioural responses, enabling the exploration of this phenomena in children of all functioning levels (Dawson et al., 2012). Compared to typically developing children, autistic children exhibited a delayed brain response to upright faces on the N170, a face-sensitive ERP (Kang et al., 2018). Parker et al. (2021) controlled for visual attention to facial expressions to examine whether directing attention to the eye normalises the N170 response in autism. They found that the autistic children's N170 response remained unchanged, subsequently supporting the

existing literature that latent N170 responses in autism are not due to atypical patterns of attention when shown experimental stimuli (Dawson et al., 2005). However, this study was limited by not directly recording visual attention to the whole screen, and, therefore, it was unable to detect modulations in the N170 response if participants fixated outside of the target area. Future research would benefit from simultaneously employing EEG and eye-tracking technology to lend greater clarity on how autistic children attend to and process facial expressions.

Gaze cues

Gaze cues have been identified as a potential preverbal indication of autism and general impairments in social understanding in children (Franchini et al., 2019). Gaze cues have been predominantly studied using eye-tracking technology to capture autism-specific differences in visual attention to social stimuli (Southgate et al., 2007; Sasson & Touchstone, 2014). It has long been suggested that autistic children spend significantly less time looking at social stimuli, resulting in difficulty anticipating the behaviour of social entities (Ruffman et al., 2001). A meta-analysis found that age was not a significant moderator, suggesting that social attention remains constant across development in autistic individuals (Chita-Tegmark, 2016). However, this suggestion should be validated with more longitudinal data as the meta-analysis was predominantly comprised of cross-sectional studies. Social content was further found to have the strongest impact on social attention, particularly when social stimuli were presented in isolation from non-social stimuli (Chita-Tegmark, 2016). Zhou et al.'s (2019) nonverbal eye-tracking task compared spontaneous social inference-making when simultaneously presented with social and non-social stimuli. Children were tasked with determining with their gaze whether a social or non-social character could offer assistance to a protagonist character, who was trying to reach for an object. In contrast to the typically developing children, the autistic children did not significantly look more at the social character. The gaze patterns of the typically developing children reflected successful execution in performing this social inference without the aid of verbal instruction whereas the autistic children did not. Zhou et al. (2019) concluded that the autistic children demonstrated difficulty in spontaneously encoding nonverbal socially relevant information. Research has further suggested that autistic children struggle distinguishing between social and non-social stimuli in both isolated and competitive social attention conditions (Wang et al., 2020). Future research that investigates which specific components of social stimuli are relevant for autistic individuals, and the kind of social information they gather from them, would lend greater clarity to how and why social stimuli

is attended to and processed differently in autism.

Preference for biological motion

Preference for biological motion is the ability to distinguish between a living versus a non-living agent based on their bodily movements. This phenomenon has been predominantly measured using Johansson's (1973) point-light display model, where reflective markers are attached to actors' joints and are filmed silently performing various actions. Whether autistic individuals have a profound and consistent impairment in attending to and processing biological motion has been a topic of considerable debate (Hsiung et al., 2019). Autistic children have been observed to orient significantly more to non-social cues such as light and background sound when watching point-light displays (Klin et al., 2009), suggesting a weaker tendency to observe and recognise sources of social information. Centelles et al. (2013) investigated how autistic children recognise and process social intention through silent body language. The autistic children were less accurate and slower to categorise social interactions compared to typically developing children. Furthermore, there was only a facilitatory effect for the typically developing children when shown human versus stick point-light displays, suggesting that autistic children have a weaker ability to recognise specifically human biological motion. However, this study was limited by its unbalanced sample (n = 12 autistic vs. n = 24 typically developing), weakening the validity of this conclusion. In contrast, a more recent EEG study by Sotoodeh et al. (2018), which further employed a behavioural recognition test, found that autistic children were just as accurate in recognising social point-light displays as the typically developing children, even though the autistic children had slower reaction times. Employing neurological measures and eye-tracking simultaneously in future point-light display research would give greater clarity on how autistic individuals recognise and process social biological motion.

Effect of comorbidity

Research has further explored the effect of comorbidity on how social cues are processed in autism. Autism is commonly comorbid with attention hyperactivity deficit disorder (ADHD) (Frith & Happé, 2020). Lukito et al. (2017) employed structural equation modelling to identify possible relations between executive function, Theory of Mind and symptoms of autism and ADHD. After controlling for IQ, they found impairments in executive function were specifically associated with ADHD symptoms, whereas impaired Theory of Mind was specifically associated with autism symptoms. Tye et al.'s (2013) EEG study was one of the first to directly compare ERP markers of face and gaze processing across autistic, ADHD, comorbid and typically

developing children. The autistic children (autism/ autism + ADHD) demonstrated specific atypical gaze processing and altered neural specialisation in the N170 ERP. In contrast, the ADHD children (ADHD/ADHD + autism) demonstrated atypical processing in early visual attention. Groom et al. (2017) further explored the Early Directing Attention Negativity (EDAN) ERP response as well as the N170, and identified atypical gaze and face processing in autistic children compared to the pure ADHD and the typically developing children. Specifically, Groom et al. (2017) found reduced activation in the autistic children's right-hemisphere, a brain region which is widely suggested to specialise in expression recognition (Dawson et al., 2012). However, these studies were limited by small and uneven samples, and, therefore, future research with larger balanced samples is needed to validate these findings.

Discussion

The following section summarises the research findings presented in the literature review. Following on, conceptual and methodological limitations of the reviewed studies are discussed.

## Relationship between language and social understanding in autistic children

The studies presented in this literature review employed nonverbal measures to explore nonverbal language, such as facial expression, gaze cues and preference for biological motion. These studies demonstrated that without the aid of verbal language, autistic children have greater difficulty in attending to and processing nonverbal social stimuli. Autistic children depend more heavily on verbal language to develop social understanding because it brings attention and meaning to nonverbal social cues they would otherwise miss. Nonverbal behaviours are crucial for the development of social understanding (Franchini et al., 2017). However, when children pay less attention to socially relevant cues and engage in less joint attention behaviours, they are less socially stimulated and do not benefit as much from social learning (Dawson et al., 2012; Franchini et al., 2017, Franchini et al., 2019). The following two figures offer a visual explanation of this hypothesis (these figures were adapted from Tager-Flusberg & Joseph's (2005) model on forming a Theory of Mind). Figure 1 depicts the typical formation of a Theory of Mind. Social awareness is created from the successful integration of information from verbal and nonverbal language and nonverbal social cues. Subsequently, social awareness informs the successful creation of one's Theory of Mind and, with it, the ability to understand false-beliefs and the mental states of others. In contrast, Figure 2 depicts the formation of Theory of Mind when nonverbal language and nonverbal social

cues are not attended to, which has been observed to be a common situation for individuals on the autism spectrum (Mundy et al., 1986). In this case, verbal language is more heavily relied upon to bring attention to nonverbal language and nonverbal social cues in developing social awareness. This suggests that in the absence of verbal language, it would be more difficult to form a Theory of Mind because social information from nonverbal language and nonverbal social cues would go unnoticed, and, therefore, unprocessed (Happé, 1995;

Lohman et al., 2005; Tager-Flusberg & Joseph, 2005)

Although the existing body of literature using nonverbal measures in autism is considerably smaller than the literature base on verbal measures, there is a growing focus on making autism research more accessible and relevant to minimally and nonverbal individuals on the autism spectrum (Happé & Frith, 2020). To achieve this, there are several barriers to future research that must be overcome, which are presented and elaborated in the following section.

Figure 1 Forming a theory of mind
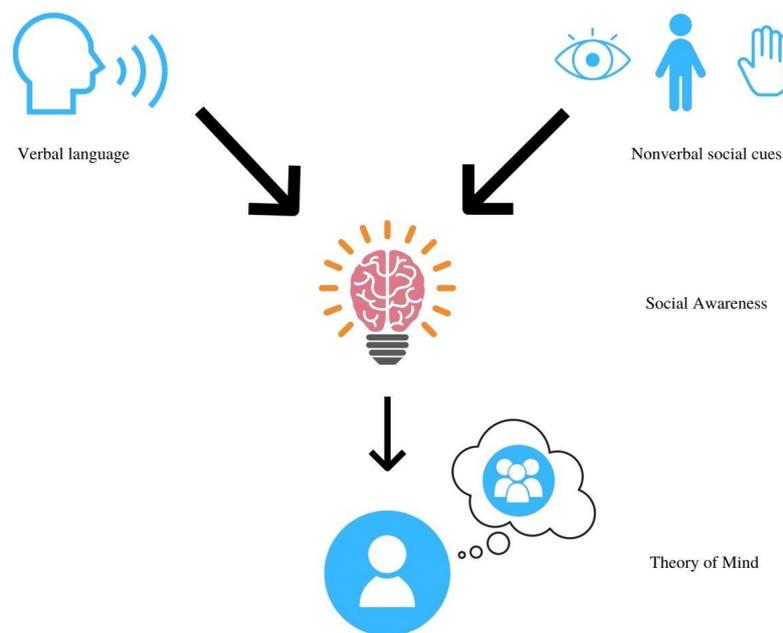
Figure 2 Forming a theory of mind in autism
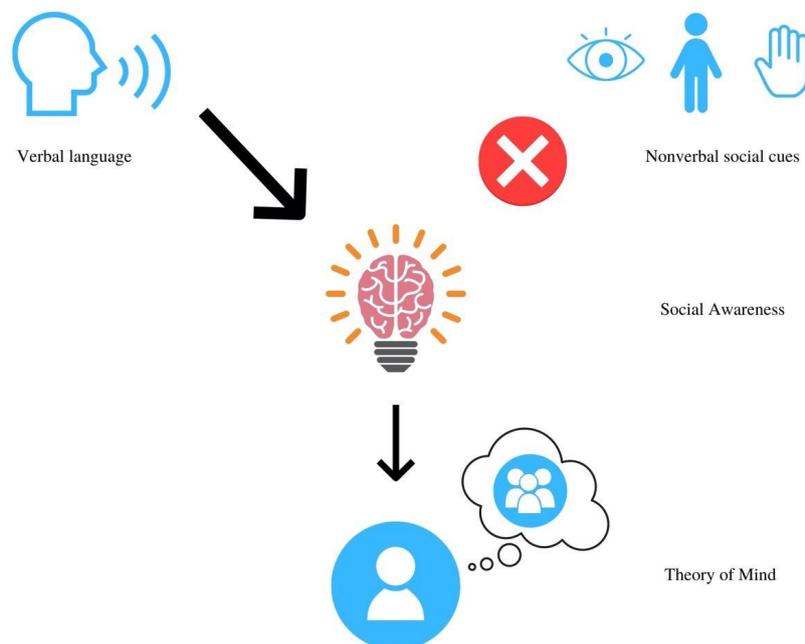
Limitations of the reviewed studies and future research directions

It is crucial to note that the manifestation and experience of autism is highly variable and multifaceted, which makes it difficult for researchers to come to a singular understanding of autism (Anastasiou & Kauffman, 2013). Over the decades, the very concept of autism has undergone numerous transformations from an unknown psychiatric condition to a widely known health concern (Bagatell, 2010). Autism has been widely understood through the lens of the deficit model of disability (Dinishak, 2016). In this model, a 'deficit' is defined as the absence or lack of some feature, trait or capacity that an individual ought to have in order to be characterised as 'typically developing' (Dinishak, 2016). This model is problematic in that it supports explanations of autism merely by pointing to a lack or absence of certain processes, without considering alternative explanations. Reducing the experiences and capacities of autistic individuals as the result of 'lacking' or 'an absence' of typical experiences perpetuates a reductionist and unbalanced understanding of a condition that evolves with the individual across their lifespan. For example, in gaze cue research (Southgate et al., 2007), the dominant explanation for this behavioural difference is that autistic individuals lack the capability to attend to social stimuli as well as their typically developing peers. However, an alternative explanation that has yet to be widely considered is that some autistic individuals actively avoid eye contact to alleviate feelings of discomfort or overstimulation (Dalton et al., 2005; Tanaka & Sung, 2013). When explored through a holistic lens, (i.e., one that considers biopsychosocial origins of behaviours), the explanation for autistic individuals' atypical gaze patterns can be a matter of choice as opposed to not having the capability. Qualitative autism research, in the form of semi-structured interviews, can further demonstrate the need for adopting a multidimensional and holistic model of understanding autism, as semi-structured interviews enable the collection of unique, rich experiences and thoughts (Magnusson & Marececk, 2015) and thus provide a humanistic perspective (Howitt & Cramer, 2017). Semi-structured interviews also provide participants the ability to express themselves in a variety of ways (e.g., speaking, drawing) and can be conducted through a variety of mediums (e.g., orally, written down, pictorially).

Another reoccurring limitation is that research samples are not representative of the wider autism spectrum. Research sample sizes comprise on average of 20-30 participants, making it difficult to generalise findings to the wider population. This tendency can be partly explained by the fact that autistic individuals have been identified as a particularly vulnerable population in psychological research ethics committees, which has limited contemporary research in terms of recruiting substantial sample sizes (Frith, 2008). Subsequently, existing research has primarily recruited autistic children without accompanying intellectual or language disability (Tager-Flusberg & Kasari, 2013).

Additionally, samples tend to be male-dominant, fuelling myths that autism is a "typically male" disorder (Shefcyk, 2015). As autism is widely reported as being more prevalent in males, this has significantly impacted research design and clinical practice (Lai et al., 2015). Contemporary research has hypothesised a "female protective model" of autism, suggesting that females may only develop autism if they experience a greater aetiological burden than males (Happé & Frith, 2020). Due to this, our understanding of autism is predominantly based on autistic males. In contrast, autistic females have been reported to exhibit less repetitive stereotyped behaviours (Mandy et al., 2012) but this difference varies depending on age and developmental level (Ruigrok & Lai, 2020). Autistic females have been further reported to possess stronger social attention, linguistic abilities and motivation for friendships, together with a tendency to 'socially camouflage' (Lai & Szatmari, 2020). Social camouflaging has been suggested to mask one's difficulties with social communication, which unfortunately contributes to autistic females being diagnosed later or not at all, culminating in poorer social outcomes (Tubío-Fungueiriño et al., 2020).

This gap in gender representation can be filled by engaging with the female autism community in a manner that is sensitive and considerate to gender and language ability differences within the community. With this in mind, autistic individuals and communities are advocating for change in how autism is considered (Bagatell, 2010). It is thus vital that future research engages with the autism community and ensures their voices are heard and supported. Research exploring attitudes towards autism research in autism communities in the UK and Europe has found an overall positive attitude (Pellicano et al., 2014; Fletcher-Watson et al., 2017). In addition, there has been a stronger focus on making contemporary autism research more inclusive by involving children and their carers in decisions about their participation, the dissemination of the research findings, and aligning research agendas with the children's' educational, social and wellbeing priorities (Chown et al., 2017; Clark & Adams, 2020). These growing efforts may encourage more autistic individuals to participate in research and lend further insight into how they wish to be supported, particularly nonverbal autistic females.

Conclusion

The relationship between verbal language and social

understanding in autism has been predominantly explored through verbal measures. This literature review aimed to evaluate studies which have employed nonverbal measures to investigate the impact of an absence of verbal language on the development of social understanding in autistic children. These studies strongly hypothesised that autistic children depend more heavily on verbal language to bring attention and meaning to nonverbal cues they would otherwise miss such as gaze cues, facial expressions and biological motion. Several methodological and conceptual limitations in the reviewed studies were discussed, including an overemphasis on the deficit model of autism, lack of participant voice and research samples that are not representative of the wider autism spectrum. Future research would benefit from employing a humanistic perspective to lend holistic understanding to the impact of the presence, or absence, of verbal language on social understanding in autism. In addition, future research adopting qualitative semi-structured interviews has the potential to empower more participants from under-represented subgroups on the spectrum to participate in autism research.

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Disclosure statement

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Appendix

Search terms used on iDiscover, Google Scholar and Research Rabbit

"Studying social understanding in autism", "Social understanding in autistic children", "Talk and social understanding in autism", "Verbal language development in autism", "Role of speech in social understanding in autism", "Role of oral language in social functioning in autism", "Non-verbal autistic children", "Development of social understanding in non-verbal autistic children", "False-belief understanding with minimally verbal autistic children", "False-belief tasks", "Non-verbal false-belief measures", "Language and false-belief tasks", "Non-verbal social communication", "Eye gaze in ADHD", "Non-verbal social communication in ADHD", "Deficit focused views of autism", "Social models of autism".